SAMSUNG

ELECTRONICS

TO : HP/Quanta

DATE : Mar. 22, 2004

SAMSUNG TFT-LCD
MODEL NO. : LTN170WX-L01

NOTE :

Any Modification of Spec is not allowed without SEC' permission

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PREPARED BY : **LCD Application Engineering Group 1, TCS Team**

SAMSUNG ELECTRONICS CO., LTD.

wise view™

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Date	Revision No.	Page	Summary
Apr. 04, 2003	000	ALL	LTN170WX-L01 model rev.000 specification was First issued.
Oct.21, 2003	A00	All	Approval specification of LTN170WX-L01 was issued.
		04	Add the EDID.
		05	Fix the weight and the depth of module size.
			Modify the minimum storage temperature from -25 ?C to -20?C .
		07	Fix the Luminance, the color chromaticity and 13 points white variation.
		10	Fix the main frequency and the power consumption.
		12	Modify the lamp current, voltage, frequency , power consumption and the startup voltage.
			Add the start up time.
		22,23	Modify the outline dimension
		24, 25	Add packing, marking and others.
		29	Add the EDID.
Mar. 16, 2004	A01	05	Change the depth of module size.
		07	Change the color chromaticity.
		22,23	Modify the outline dimension

Samsung Secret

GENERAL DESCRIPTION

DESCRIPTION

LTN170WX-L01 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight system. The resolution of a 17.0" contains 1,440 x 900 pixels and can display up to 262,144 colors. 6 O'clock direction is the optimum viewing angle.

FEATURES

- High contrast ratio
- 1440 x 900 pixels resolution
- Low power consumption
- DE (Data enable) only mode.
- 3.3V LVDS Interface
- On board EDID chip

APPLICATIONS

- Notebook PC
- If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	367.20(H) X 229.5(V) (17.0"diagonal)	mm	
Driver element	a-si TFT active matrix		
Display colors	262,144		
Number of pixel	1440 x 900(16 : 10)	pixel	
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.255(H) x 0.255(V) , 99.6 dpi	mm	
Display Mode	Normally white		
Surface treatment	Haze 25, Hard-Coating 3H		

Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	381.7	382.2	382.7	mm	
	Vertical (V)	244.0	244.5	245.0	mm	
	Depth (D)	-	-	7.0	mm	(1)
Weight		-	800	820	g	

Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
. Push Force : 500g f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	T_{STG}	-20	60	?C	(1)
Operating temperate (Temperature of glass surface)	T_{OPR}	0	50	?C	(1)
Shock (non-operating)	Snop	-	240	G	(2),(4)
Vibration (non-operating)	Vnop	-	2.41	G	(3),(4)

Note   (1) Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 ?C ? Ta)
Maximum wet - bulb temperature at 39 ^{O}C or less. (Ta ? 40 ?C) No condensation

Relative Humidity (%RH)

(40,90)

Operating Range

(50,50.4)

(60,27.7)

Storage Range

Temperature (^{O}C)
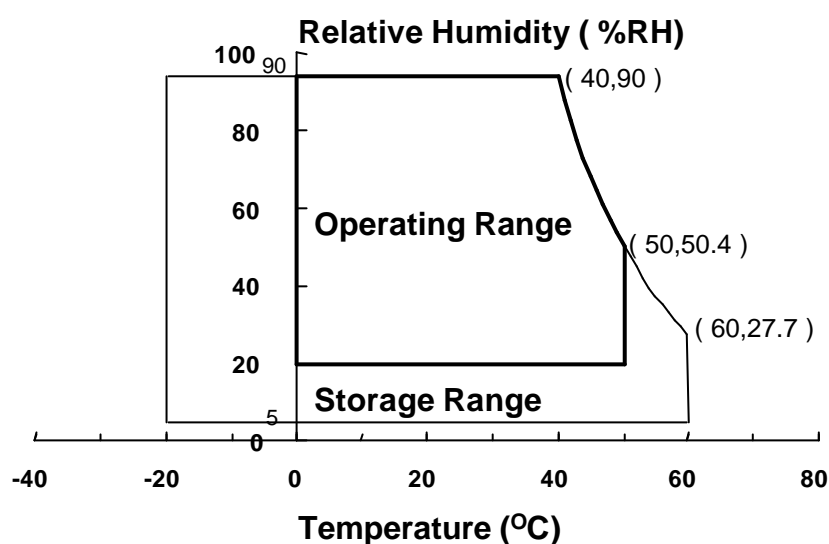
(2) 2ms, half sine wave, one time for ? X, ?Y, ? Z.
(3) 5 - 500 Hz, random vibration, 30min for X, Y, Z.
(4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be
hard and rigid enough so that the Module would not be twisted or bent by the fixture.

1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

V_{DD}=3.3V, Vss=GND= 0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	V_{DD}	V_{DD} -0.3	V_{DD} +0.3	V	(1)
Logic Input Voltage	V_{IN}	V_{DD} -0.3	V_{DD} +0.3	V	(1)

Note 1) Within Ta = (25 ? 2 ?C)

(2) BACK-LIGHT UNIT

Ta = 25 ? 2 ?C

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Lamp Current	I_L	3.0	7.0	mArms	(1)
Lamp frequency	F_L	45	70	kHz	(1)

Note 1) Permanent damage to the device may occur if maximum values are exceeded
Functional operation should be restricted to the conditions described under normal operating condition
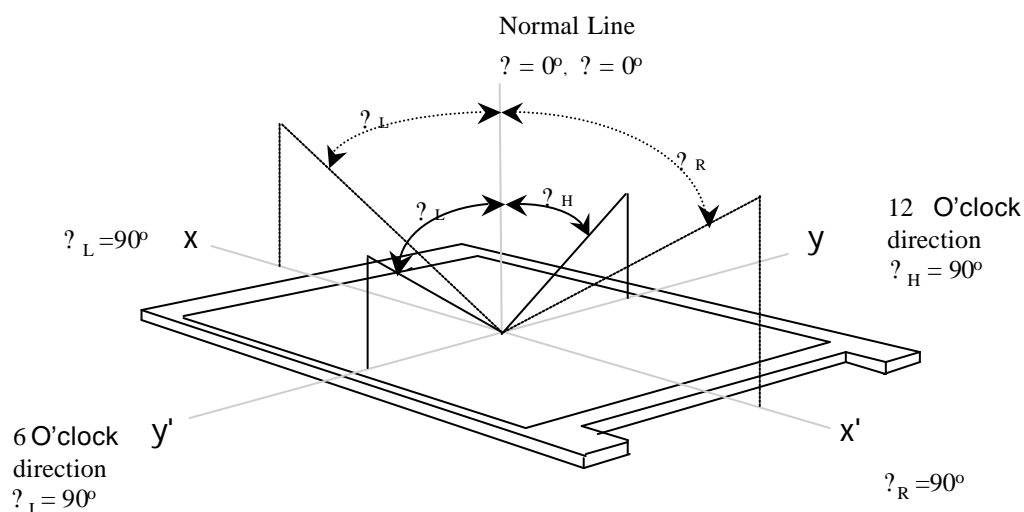
2. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5). Measuring equipment : TOPCON BM-5A

* Ta = 25 ? 2 ?C, V_{DD}=3.3V, fv= 60Hz, f_{DCLK}=48.153MHz, (I_L= 6.5 mA)

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR		200	300	-	-	(1), (2), (5)
Response Time at Ta	Rising	T_R			6	10		(1), (3)
	Falling	T_F		-	25	30	msec	
Average Luminance of White (5 Points)		$Y_{L,AVE}$		145	170	-	cd/m^2	I_L=6.5mA (1), (4)
Color Chromaticity (CIE)	Red	R_X	Normal Viewing Angle ? = 0 ? = 0	0.574	0.604	0.634	-	(1), (5) PR-650
		R_Y		0.318	0.348	0.378		
	Green	G_X		0.272	0.302	0.332		
		G_Y		0.508	0.538	0.568		
	Blue	B_X		0.119	0.149	0.179		
		B_Y		0.091	0.121	0.151		
	White	W_X		0.283	0.313	0.343		
		W_Y		0.299	0.329	0.359		
Viewing Angle	Hor.	$?_L$	CR ? 10	60			Degrees	(1), (5) BM-5A
		$?_H$		60				
	Ver.	$?_H$		45				
		$?_L$		50				
13 Points White Variation		$?_L$		-	-	1.7	-	(6)

Note 1) Definition of Viewing Angle : Viewing angle range(10 ? C/R)

Normal Line

$? = 0^o, ? = 0^o$

$?_L$

$?_R$

$?_L = 90^o$ x

$?_L$ $?_H$

y

12 O'clock direction $?_H = 90^o$

6 O'clock direction $?_L = 90^o$ y'

x'

$?_R = 90^o$

Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

Points : ④ , ⑤ , ⑦ , ⑨ , ⑩   at the figure of Note (6).

Note 3) Definition of Response time :

Display data   White(TFT OFF)   Black(TFT ON)   White(TFT OFF)

T_R T_F

Optical Response

100%
90%

10%
0%

Time
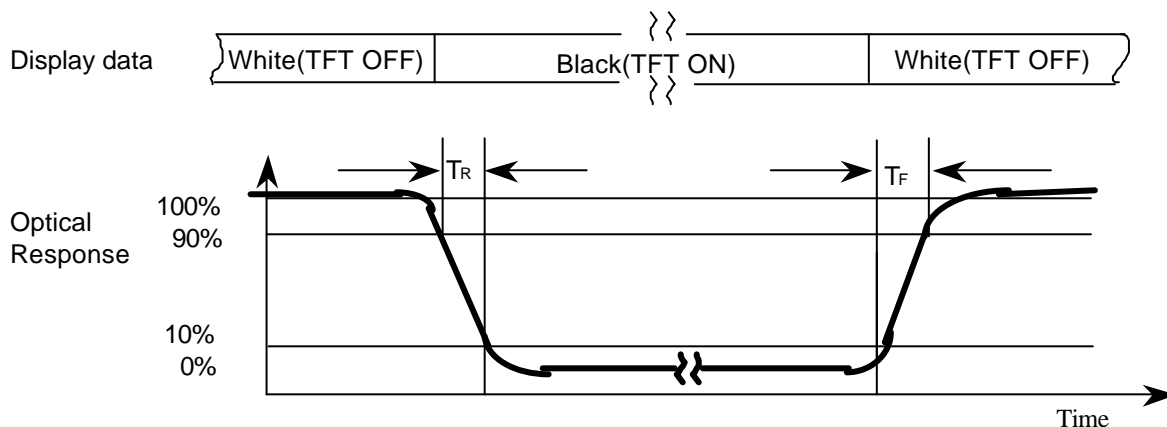
Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

(360)   (720)   (1080)

Average Luminance of White ($Y_{L,AVE}$)

VIEW AREA

$$Y_{L,AVE} = \frac{Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}}{5}$$

⑩   ⑨   (225)

⑦   (450)

⑤   ④   (675) (lines)
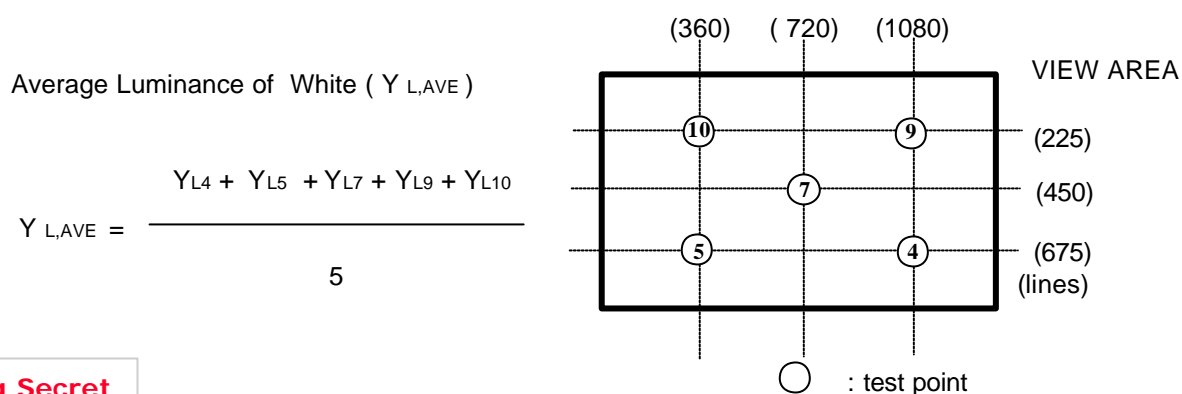
◯ : test point

Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
Lamp current : 6.0mA (Inverter : SIC-130T)
Environment condition : Ta = 25 ? 2 ?C

Photodetector
(TOPCON BM-5A)

Field = 2?

50 cm

TFT-LCD module

LCD panel

Center of the screen
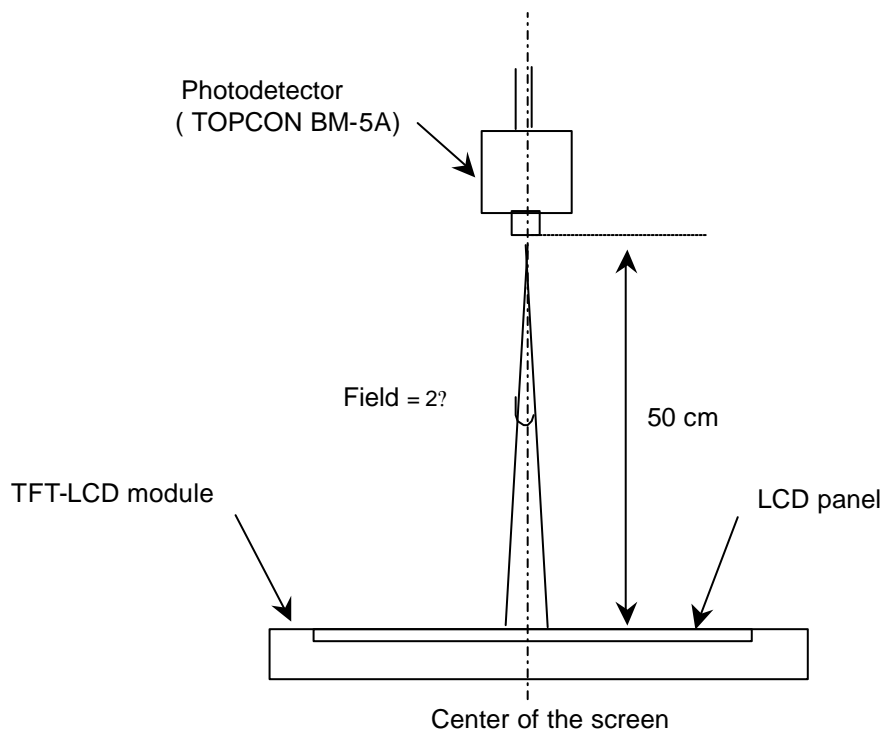
Optical characteristics measurement setup

Note 6) Definition of 13 points white variation (? L), CR variation(CVER) [① ~ ⑬]

$$? L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$

10mm   360   720   1080   **10mm**

10mm

13   12   11

10   9   225

8   7   6   450   ◯   : test point

5   4   675
(lines)

3   2   1

10mm

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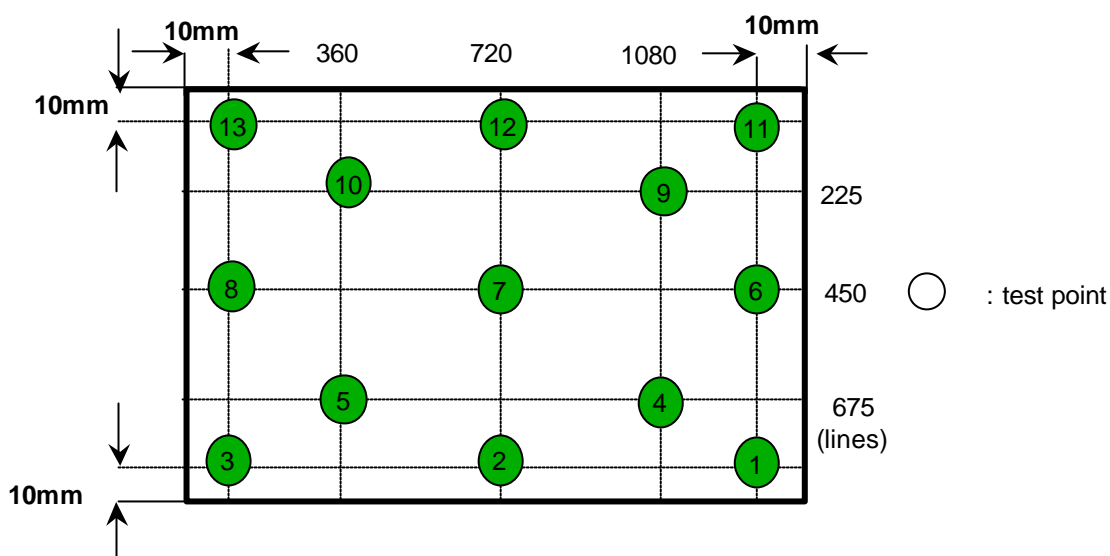
3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ? 2 ?C

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM}=+1.2V
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Hsync Frequency		f_H	-	54.72	-	KHz	
Main Frequency		f_{DCLK}	-	48.153	-	MHz	
Rush Current		I_{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I_{DD}	-	450	-	mA	(2),(3)*a
	Mosaic		-	480	-	mA	(2),(3)*b
	V.stripe		-	560	700	mA	(2),(3)*c

Note (1) Display data pins and timing signal pins should be connected.(GND=0V)

(2) fv=54.72Hz, f_{DCLK} =48.153MHZ, Vdd = 3.3V , DC Current.

(3) Power dissipation pattern

*a) White Pattern   *b) Mosaic Pattern

VIEW AREA

Display Brightest Gray Level

Display Darkest Gray Level
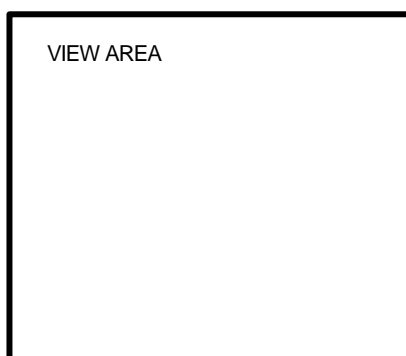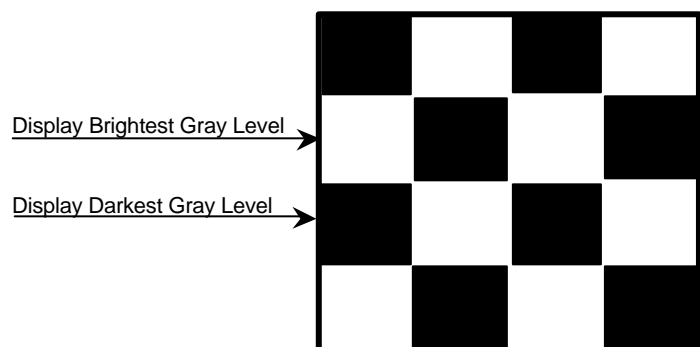
*c) 1dot Vertical stripe pattern
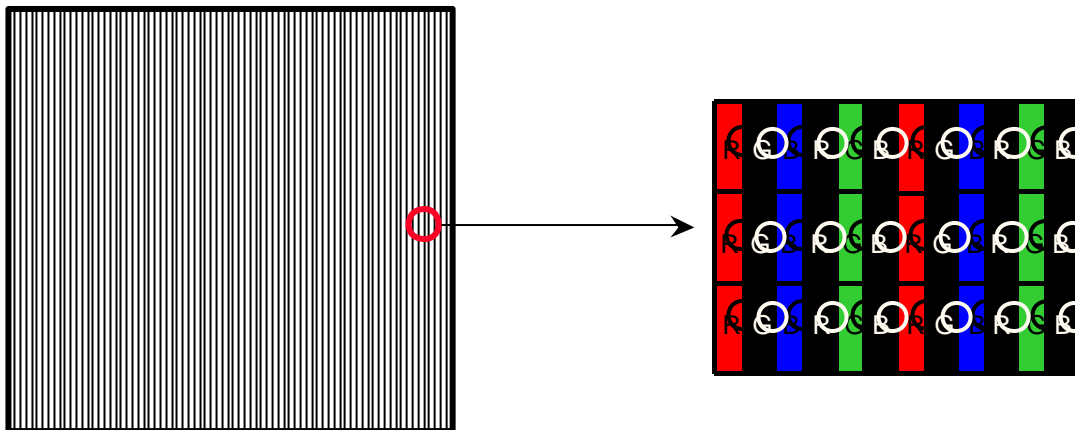
4) Rush current measurement condition

3.3V

M1
2SK1059

R1
47K

FUSE

C1
1uF

V$_{DD}$ (LCD INPUT)

CONTROL SIGNAL
(HIGH to LOW)

R2
1K

M2
2SK1399

12V

R3
47K

C2
10000pF

C3
1uF
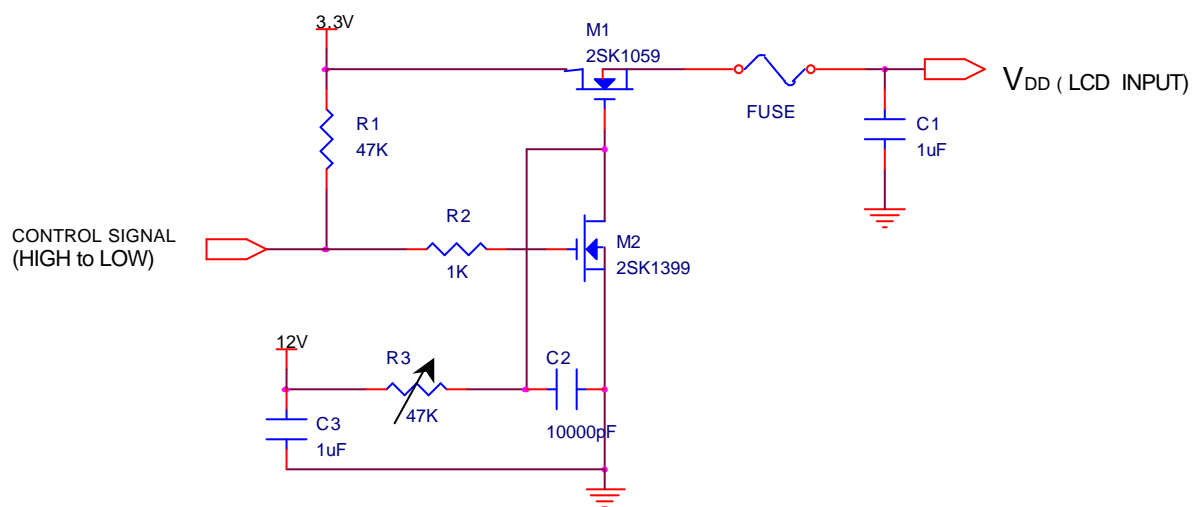
V$_{DD}$ rising time is 470us

0.9V$_{DD}$ 3.3V

GND   0.1V$_{DD}$

470us
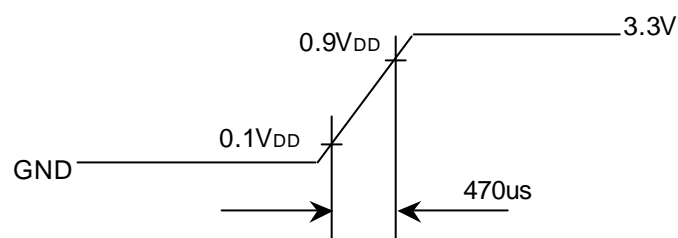
3.2 BACK-LIGHT UNIT

The backlight system is an edge-lighting type with a single CCFT (Cold Cathode Fluorescent Tube).
The characteristics of a single lamp are shown in the following table.

- INVERTER : SEM SIC 130T   Ta= 25 ? 2 ?C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp Current	I_L	4.0	6.0	6.5	mArms	(1)
Lamp Voltage	V_L	-	730	-	Vrms	I_L=6.0mA
Frequency	f_L	55	60	65	KHz	(2)
Power Consumption	P_L		4.38		W	(3) I_L=6.0mA
Operating Life Time	Hr	10,000			Hour	(4)
Startup Voltage	V_S	-	-	1450	Vrms	25?C, (5)
				1800	Vrms	0?C, (5)
Lamp startup time		-	-	1.0	sec	(5)

Note) The waveform of the inverter output voltage must be area symmetric and the design of the inverter must have specifications for the modularized lamp.

The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter(miss lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Note (1) Lamp current is measured with a high frequency current meter as shown below.

LCD MODULE — 1 2 — HOT : (Pink) / COLD : (White) — (A) — INVERTER (SIC-130T)

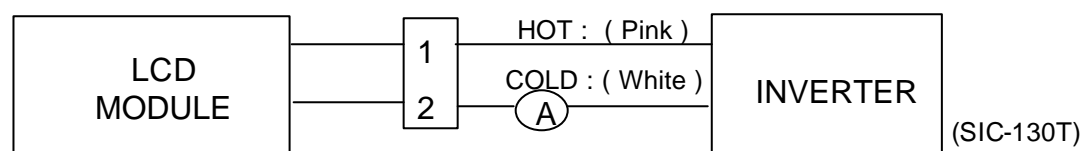(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Refer to I_L ? V_L to calculate.

(4) Life time (Hr) of a lamp can be defined as the time in which it continues to operate under the condition Ta= 25 ? 2 ?C and I_L = 6.0 mArms until one of the following event occurs.

1. When the brightness becomes 50% or lower than the original.
2. When the Effective ignition length becomes 80% or lower than the original value.
   (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

(5) The inverter open voltage - this voltage should be measured after ballast capacitor - have to be larger than the lamp startup voltage, otherwise backlight may has blinking for a moment after turns on or not be turned on.
If an inverter has shutdown function it should keep its open voltage for longer than 1 second even if lamp connector open.

4. BLOCK DIAGRAM

4.1 TFT LCD Module

I²C bus → EDID EEPROM

Input-Connector *FI-XB30S-HF10 or Compatible*

LVDS → LVDS Input/RSDS Output Timing Controller → *RSDS*

Source Driver IC

17.0" WXGA TFT-LCD Panel

DC-DC Converter

Gamma Generator

VCOM Generator

Gate Driver IC

SOURCE PCB

→ Video Signal
→ Control Signal
→ VCOM
→ Gamma
→ DVDD
→ AVDD
→ Von/Voff

4.2 BACK-LIGHT UNIT

Reflector

LAMP

1 HOT (Pink)

2 COLD (White)
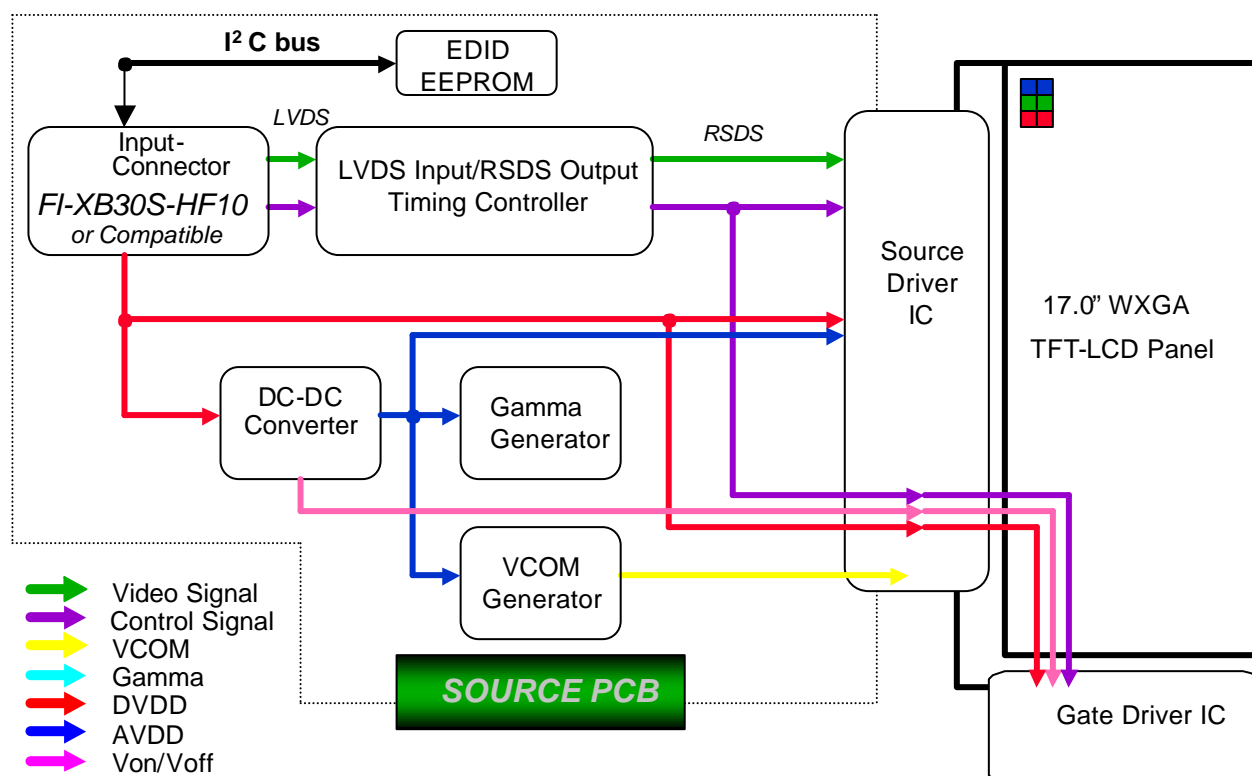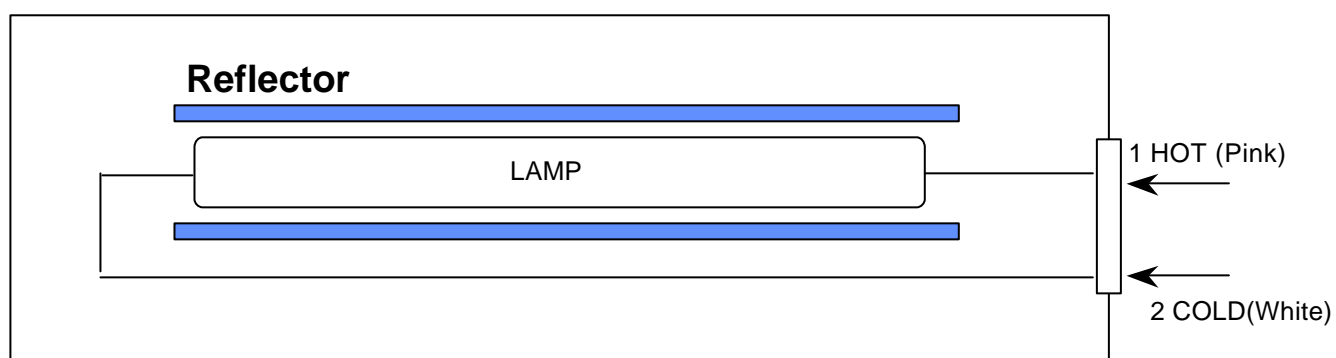
5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : JAE FI-XB30SL-HF10 or compatible)
　　　　　　　　　　　Mating Connector : JAE FI-X30M or compatible)

No.	Symbol	Function	Polarity	Remarks
1	GND	Ground		
2	VDD	POWER SUPPLY +3.3V		
3	VDD	POWER SUPPLY +3.3V		
4	VEEDID	DDC 3.3V Power		
5	GND	Ground		
6	CLKEDID	DDC Clock		
7	DATAEDID	DDC data		
8	O_RxIN0-	LVDS Differential Data INPUT (Odd R0-R5,G0)	Negative	
9	O_RxIN0+	LVDS Differential Data INPUT (Odd R0-R5,G0)	Positive	
10	GND	Ground		
11	O_RxIN1-	LVDS Differential Data INPUT (Odd G1-G5,B0-B1)	Negative	
12	O_RxIN1+	LVDS Differential Data INPUT (Odd G1-G5,B0-B1)	Positive	
13	GND	Ground		
14	O_RxIN2-	LVDS Differential Data INPUT (Odd B2-B5,Sync,DE)	Negative	
15	O_RxIN2+	LVDS Differential Data INPUT (Odd B2-B5,Sync,DE)	Positive	
16	GND	Ground		
17	O_RxCLK-	LVDS Differential Data INPUT (Odd Clock)	Negative	
18	O_RxCLK+	LVDS Differential Data INPUT (Odd Clock)	Positive	
19	GND	Ground		
20	E_RxIN0-	LVDS Differential Data INPUT (Even R0-R5,G0)	Negative	
21	E_RxIN0+	LVDS Differential Data INPUT (Even R0-R5,G0)	Positive	
22	GND	Ground		
23	E_RxIN1-	LVDS Differential Data INPUT (Even G1-G5,B0-B1)	Negative	
24	E_RxIN1+	LVDS Differential Data INPUT (Even G1-G5,B0-B1)	Positive	
25	GND	Ground		
26	E_RxIN2-	LVDS Differential Data INPUT (Even B2-B5,Sync,DE)	Negative	
27	E_RxIN2+	LVDS Differential Data INPUT (Even B2-B5,Sync,DE)	Positive	
28	GND	Ground		
29	E_RxCLK-	LVDS Differential Data INPUT (Even Clock)	Negative	
30	E_RxCLK+	LVDS Differential Data INPUT (Even Clock)	Positive	

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5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

LVDS for Odd pixel

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
44	TxIN0	RO0	12	TxIN11	GO5
45	TxIN1	RO1	13	TxIN12	BO0
47	TxIN2	RO2	15	TxIN13	BO1
48	TxIN3	RO3	16	TxIN14	BO2
1	TxIN4	RO4	18	TxIN15	BO3
3	TxIN5	RO5	19	TxIN16	BO4
4	TxIN6	GO0	20	TxIN17	BO5
6	TxIN7	GO1	22	TxIN18	Hsync
7	TxIN8	GO2	23	TxIN19	Vsync
9	TxIN9	GO3	25	TxIN20	DE
10	TxIN10	GO4	26	TxCLK IN	Clock

LVDS for Even pixel

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
44	TxIN0	RE0	12	TxIN11	GE5
45	TxIN1	RE1	13	TxIN12	BE0
47	TxIN2	RE2	15	TxIN13	BE1
48	TxIN3	RE3	16	TxIN14	BE2
1	TxIN4	RE4	18	TxIN15	BE3
3	TxIN5	RE5	19	TxIN16	BE4
4	TxIN6	GE0	20	TxIN17	BE5
6	TxIN7	GE1	22	TxIN18	Hsync
7	TxIN8	GE2	23	TxIN19	Vsync
9	TxIN9	GE3	25	TxIN20	DE
10	TxIN10	GE4	26	TxCLK IN	Clock

Flat Link Interface

Graphics controller 36-bit

ODD RED0	44
ODD RED1	45
ODD RED2	47
ODD RED3	48
ODD RED4	1
ODD RED5	3
ODD GREEN0	4
ODD GREEN1	6
ODD GREEN2	7
ODD GREEN3	9
ODD GREEN4	10
ODD GREEN5	12
ODD BLUE0	13
ODD BLUE1	15
ODD BLUE2	16
ODD BLUE3	18
ODD BLUE4	19
ODD BLUE5	20
Hsync	22
Vsync	23
Enable	25
CLOCK	26

DS90CF363 or compatible

		JAE,FI-XB30SL-HF10		LPD91826
TxOUT0 -	41	8	100 ?	O_RxIN0-
TxOUT0+	40	9		O_RxIN0+
TxOUT1 -	39	11	100 ?	O_RxIN1-
TxOUT1+	38	12		O_RxIN1+
TxOUT2 -	35	14	100 ?	RxIN2-
TxOUT2+	34	15		RxIN2+
TxCLKOUT-	33	17	100 ?	RxCLK-
TxCLKOUT+	32	18		RxCLK+

EVEN (Graphics controller)

EVEN RED0	44
EVEN RED1	45
EVEN RED2	47
EVEN RED3	48
EVEN RED4	1
EVEN RED5	3
EVEN GREEN0	4
EVEN GREEN1	6
EVEN GREEN2	7
EVEN GREEN3	9
EVEN GREEN4	10
EVEN GREEN5	12
EVEN BLUE0	13
EVEN BLUE1	15
EVEN BLUE2	16
EVEN BLUE3	18
EVEN BLUE4	19
EVEN BLUE5	20
Hsync	22
Vsync	23
Enable	25
CLOCK	26

DS90CF363 or compatible

		JAE,FI-XB30SL-HF10		LPD91826
TxOUT0 -	41	20	100 ?	E_RxIN0-
TxOUT0+	40	21		E_RxIN0+
TxOUT1 -	39	23	100 ?	E_RxIN1-
TxOUT1+	38	24		E_RxIN1+
TxOUT2 -	35	26	100 ?	E_RxIN2-
TxOUT2+	34	27		E_RxIN2+
TxCLKOUT-	33	29	100 ?	E_RxCLK-
TxCLKOUT+	32	30		E_RxCLK+

Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

5.3 BACK LIGHT UNIT

Connector : JST BHSR - 02VS -1
Mating Connector : SM02B-BHSS-1(JST)

Pin NO.	Symbol	Color	Function
1	HOT	Pink	High Voltage
2	COLD	White	Low Voltage

5.4 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON

Approval
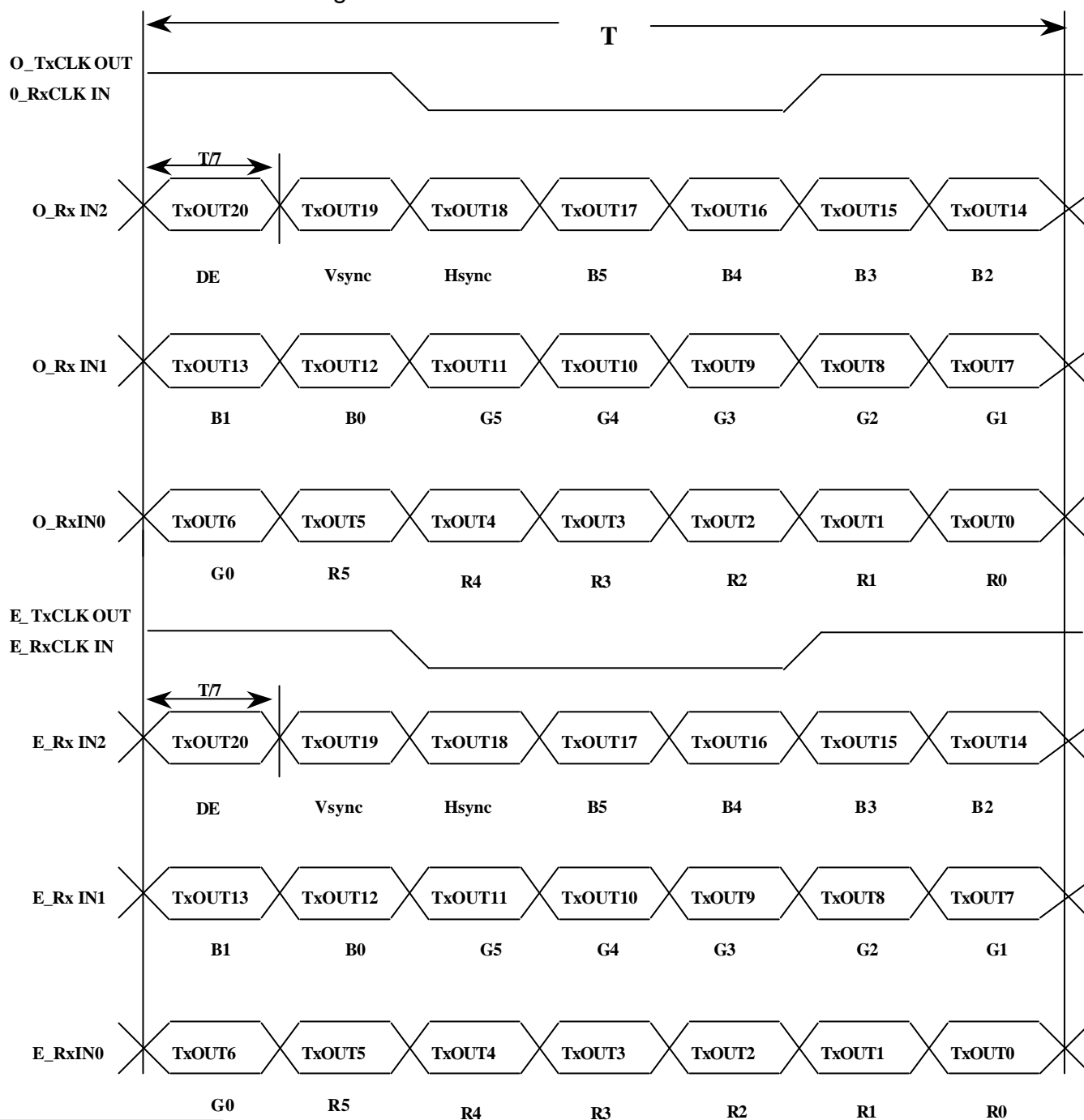
5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

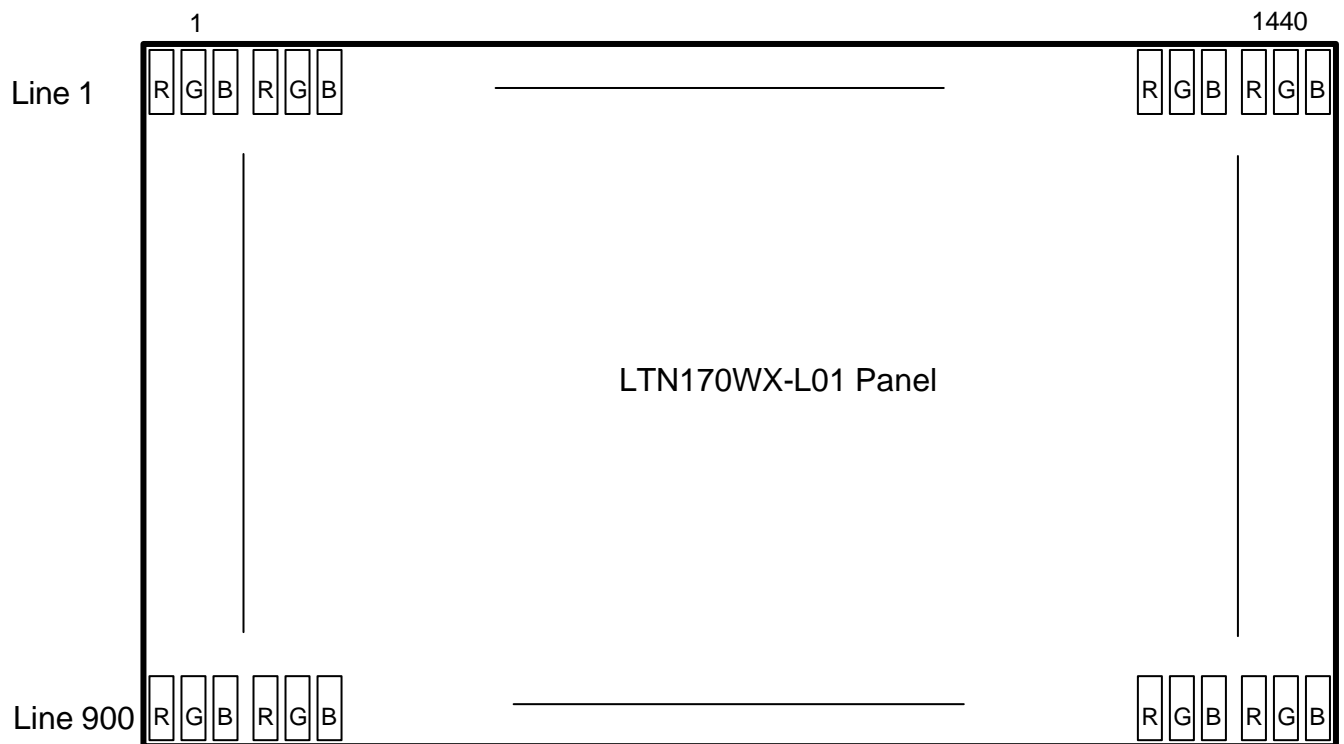| Color	Display	Data Signal																		Gray Scale Level
		Red						Green						Blue						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	45	B5	
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	-
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	-
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
Gray Scale Of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	Dark	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	?	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3?R60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	?	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	Light	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
Gray Scale Of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	Dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	G1
	?	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3?G60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	?	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	Light	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
Gray Scale Of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	B1
	?	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3?B60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	?	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

Note 1) Definition of gray :
　　Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)
Note 2)Input signal: 0 =Low level voltage, 1=High level voltage

5.6 Pixel Format in the display

1   1440

Line 1   R G B   R G B   R G B   R G B

LTN170WX-L01 Panel

Line 900   R G B   R G B   R G B   R G B

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6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	MIN	TYP	MAX	Unit	Note
Frame Frequency	Cycle	T_V	904	912	970	lines	
Vertical Active Display Term	Display Period	T_{VD}	-	900	-	lines	
One Line Scanning Time	Cycle	T_H	840	880	950	clocks	
Horizontal Active Display Term	Display Period	T_{HD}	-	720	-	clocks	

6.2 Timing diagrams of interface signal

DE

T_V

T_{VD}

T_H

DCLK

T_C

DE

T_{HD}

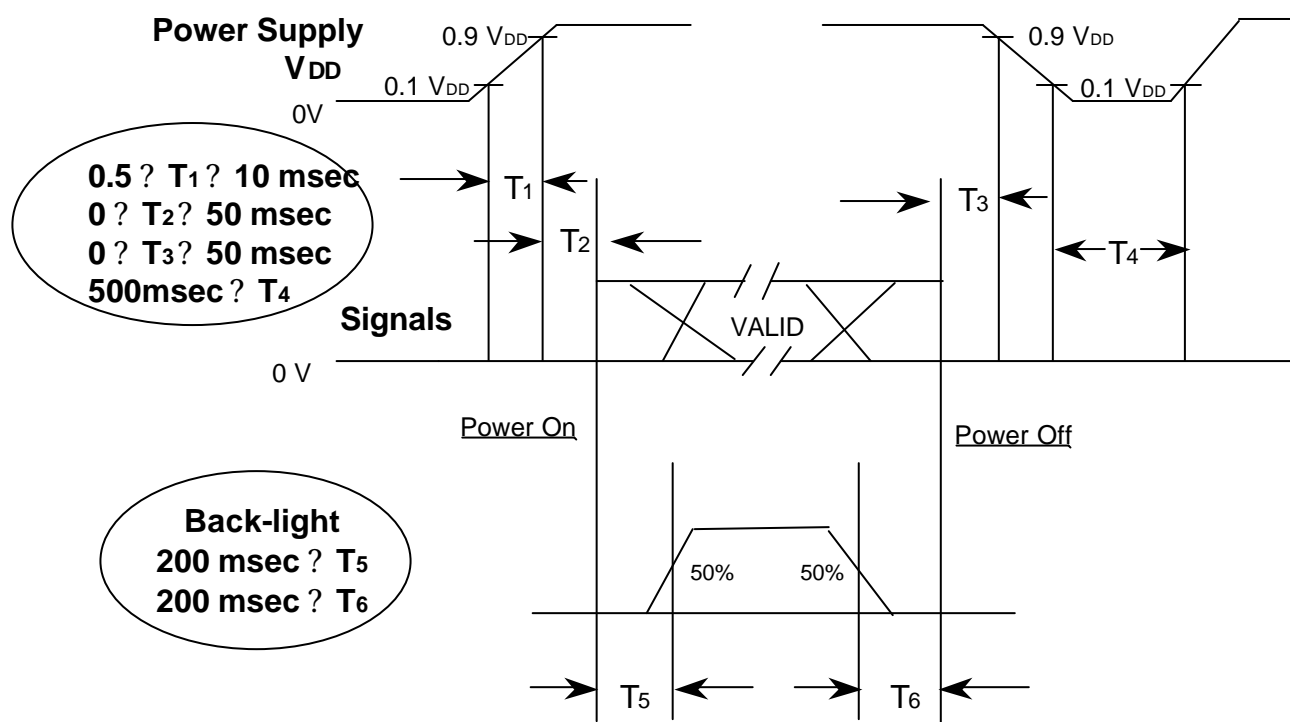DATA SIGNALS

Valid display data (720 pixel)
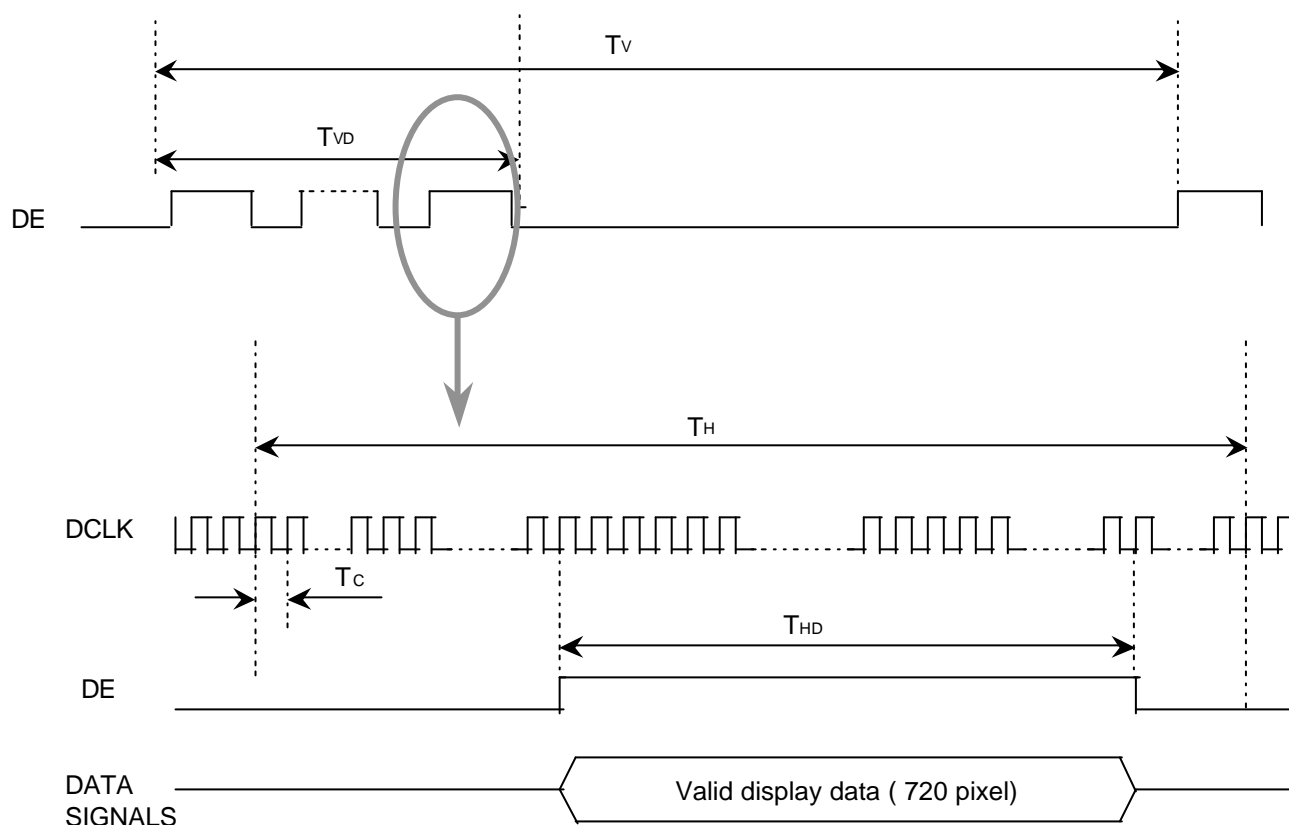
Note : All input condition(level&timing) for LPD91826 are the same with those of NS DS90CF384 or compatible.

Samsung Secret

6.3 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.

Power Supply V_{DD}

0.9 V_{DD} .... 0.9 V_{DD}

0.1 V_{DD} .... 0.1 V_{DD}

0V

0.5 ? T_1 ? 10 msec
0 ? T_2 ? 50 msec
0 ? T_3 ? 50 msec
500msec ? T_4

T_1 T_3

T_2 T_4

Signals

VALID

0 V

Power On Power Off

Back-light
200 msec ? T_5
200 msec ? T_6

50% 50%

T_5 T_6

Power ON/OFF Sequence

T1 : Vdd rising time from 10% to 90%
T2 : The time from Vdd to valid data at power ON.
T3 : The time from valid data off to Vdd off at power Off.
T4 : Vdd off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

NOTE.

(1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of V_{DD} = off level, please keep the level of input signals on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

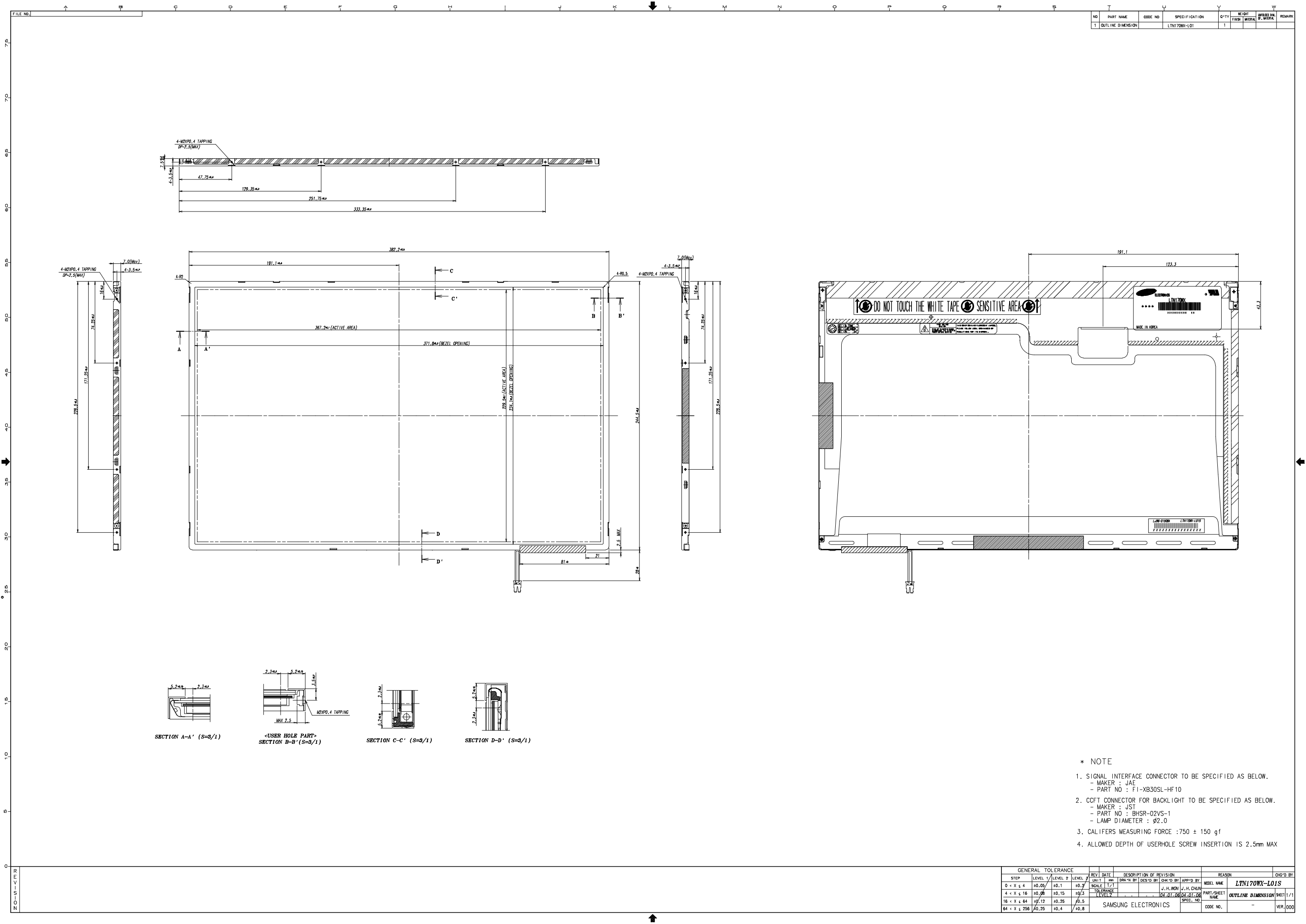## 7. Mechanical Outline Dimension

[Refer to the next page]

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT FINISH	MATERIAL	UNFILLED DWG. OF. MATERIAL	REMARK
1	OUTLINE DIMENSION		LTN170WX-L01	1				

4-M2XP0.4 TAPPING
DP-7.5(MAX)

4-M2XP0.4 TAPPING
DP-7.5(MAX)

4-M2XP0.4 TAPPING

SECTION A-A' (S=3/1)

<USER HOLE PART>
SECTION B-B' (S=3/1)

M2XP0.4 TAPPING

MAX 7.5

SECTION C-C' (S=3/1)

SECTION D-D' (S=3/1)

DO NOT TOUCH THE WHITE TAPE   SENSITIVE AREA

MADE IN KOREA

* NOTE

1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   - MAKER : JAE
   - PART NO : FI-XB30SL-HF10

2. CCFT CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW.
   - MAKER : JST
   - PART NO : BHSR-02VS-1
   - LAMP DIAMETER : φ2.0

3. CALIFERS MEASURING FORCE :750 ± 150 gf

4. ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 2.5mm MAX

GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY

UNIT : mm
SCALE : 1/1

MODEL NAME : LTN170WX-L01S

PART/SHEET NAME : OUTLINE DIMENSION SHEET 1/1

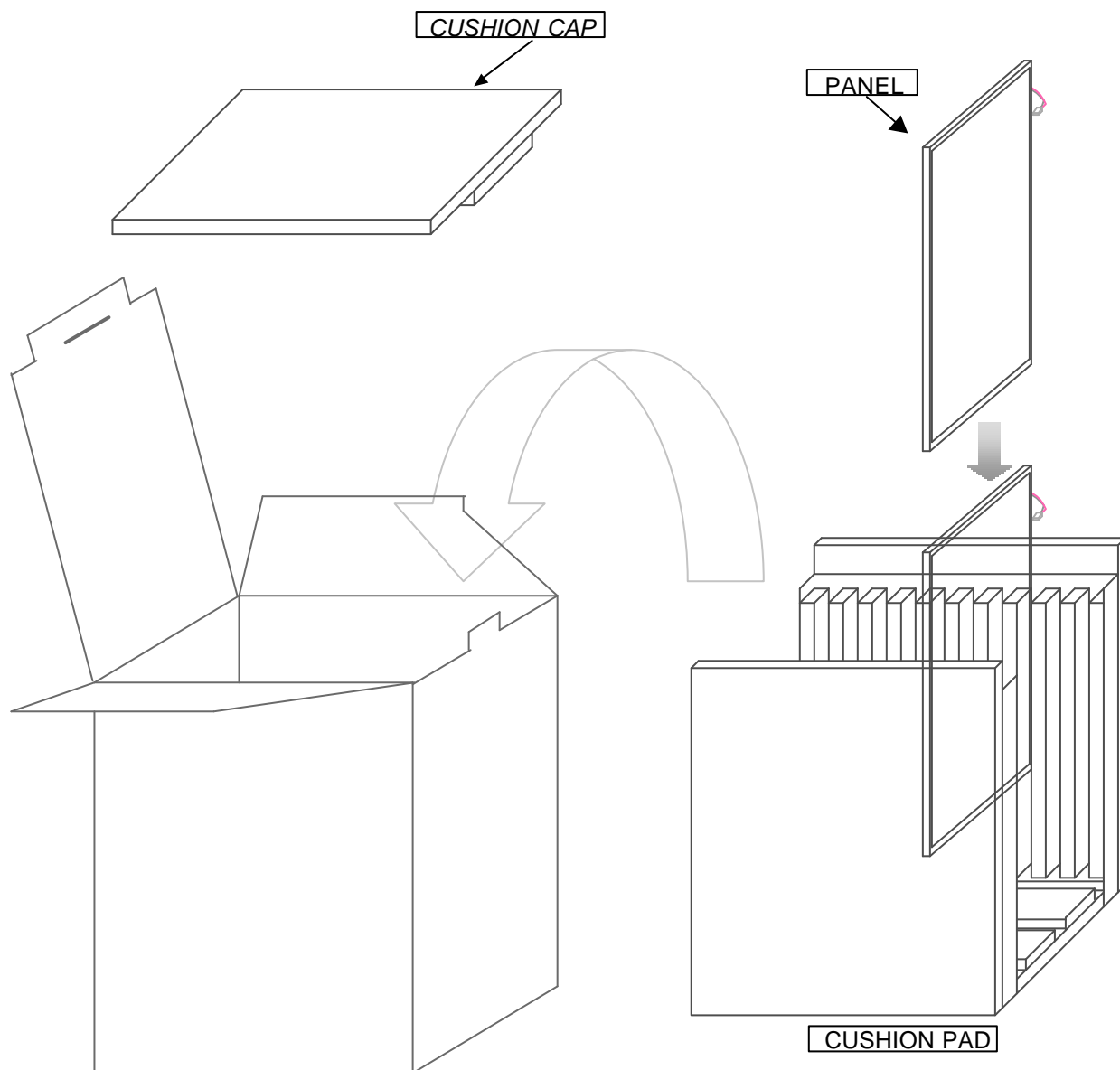SAMSUNG ELECTRONICS

SPEC. NO.

CODE NO.   VER.000

8. Packing

8.1 Packing

CARTON(Internal Package)

(1)Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2)Packing Method

CUSHION CAP

PANEL

CUSHION PAD

Note (1)Total : Approx.　10.0Kg

(2)Acceptance number of piling : 10 sets

(3)Carton size : 376(W) X 326(D) X 404(H)

(3)Packing Material

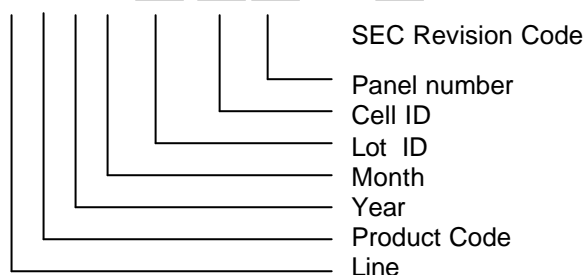| No	Part name	Quantity
1	Static electric protective sack	10
2	Packing case (Inner box) included shock absorber	1 set
3	Pictorial marking	2 pcs
4	Carton	1 set

9. MARKINGS & OTHERS

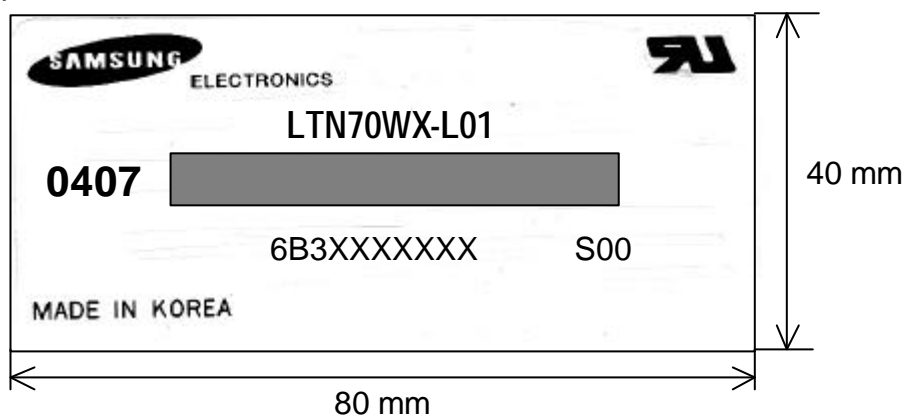A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1)Parts number : LTN170WX-L01
(2)Revision code : 3 letters
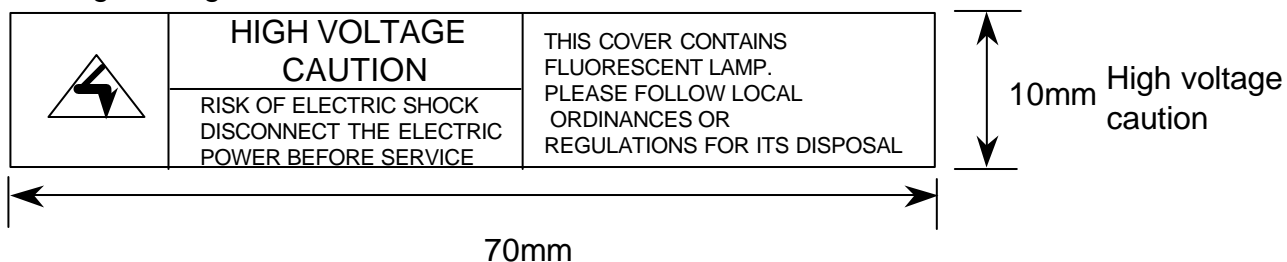(3)Lot number : 6 B 3 C XX XX XX   XXX

SEC Revision Code
Panel number
Cell ID
Lot ID
Month
Year
Product Code
Line

(5) Nameplate Indication

SAMSUNG ELECTRONICS

LTN70WX-L01

0407

6B3XXXXXXX   S00

MADE IN KOREA

40 mm

80 mm
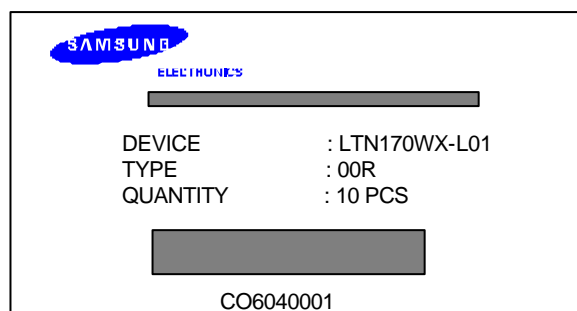
Parts name   : LTN170WX-L01
Lot number   : 6B3XXXXXXX
Inspected work week   : 0407(2004 year 7th week)
Product Revision Code : S00

High voltage caution label

	HIGH VOLTAGE CAUTION RISK OF ELECTRIC SHOCK DISCONNECT THE ELECTRIC POWER BEFORE SERVICE	THIS COVER CONTAINS FLUORESCENT LAMP. PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR ITS DISPOSAL

10mm High voltage caution

70mm

(6) Packing small box attach

SAMSUNG
ELECTRONICS

DEVICE   : LTN170WX-L01
TYPE   : 00R
QUANTITY   : 10 PCS

CO6040001

(7) Packing box Marking : Samsung TFT-LCD Brand Name

10. GENERAL PRECAUTIONS

1. Handling

  (a) When the module is assembled, It should be attached to the system firmly
     using every mounting holes. Be careful not to twist and bend the modules.

  (b) Refrain from strong mechanical shock and / or any force to the module. In addition to
     damage, this may cause improper operation or damage to the module and CCFT backlight.

  (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch
     the surface harder than a HB pencil lead.

  (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time,
     Staining and discoloration may occur.

  (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

  (f) The desirable cleaners are water, IPA(Isoprophyl Alcohol) or Hexane.
     Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl
     chloride. It might permanent damage to the polarizer due to chemical reaction.

  (g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or
     mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly
     with soap.

  (h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.

  (i) Use fingerstalls with soft gloves in order to keep display clean during the incoming
     inspection and assembly process.

  (j) Do not disassemble the module.

  (k) Do not pull or fold the lamp wire.

  (l) Do not adjust the variable resistor which is located on the back side.

  (m) Protection film for polarizer on the module shall be slowly peeled off just before use so
     that the electrostatic charge can be minimized.

  (n) Pins of I/F connector shall not be touched directly with bare hands.

2. STORAGE

(a) Do not leave the module in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 ?C and
relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent
light during the store.

3. OPERATION

(a) Do not connect,disconnect the module in the " Power On" condition.

(b) Power supply should always be turned on/off by following item 6.3
" Power on/off sequence ".

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic
interference shall be done by system manufacturers. Grounding and shielding methods
may be important to minimize the interference.

(d) The cable between the backlight connector and its inverter power supply shall be a
minimized length and be connected directly . The longer cable between the backlight
and the inverter may cause lower luminance of lamp(CCFT) and may require higher
startup voltage(Vs).

(e) The standard limited warranty is only applicable when the module is used for general
notebook applications. If used for purposes other than as specified, SEC is not to be
held reliable for the defective operations. It is strongly recommended to contact SEC
to find out fitness for a particular purpose.

4. OTHERS

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection
of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input
voltage variation, variation in part contents and environmental temperature, so on)
Otherwise the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time,it can be
the situation when the image "sticks" to the screen.

(e) This module has its circuitry PCB's on the rear side and should be handled carefully in
order not to be stressed.

11. EDID

Address (HEX)	FUNCTION	Value HEX	BIN	DEC	ASCII or Data	Notes
00	Header	00	00000000	0		EDID Header
01		FF	11111111	255		
02		FF	11111111	255		
03		FF	11111111	255		
04		FF	11111111	255		
05		FF	11111111	255		
06		FF	11111111	255		
07		00	00000000	0		
08	ID Manufacturer Name	4C	01001100	76	S E C	3 character ID
09		A3	10100011	163		"SEC"
0A	ID Product Code	00	00000000	0		
0B		00	00000000	0		
0C	32-bit serial no.	00	00000000	0		
0D		00	00000000	0		
0E		00	00000000	0		
0F		00	00000000	0		
10	Week of manufacture	00	00000000	0		
11	Year of manufacture	0D	00001101	13	2003	2003
12	EDID Structure Ver.	01	00000001	1	1	EDID Ver. 1.0
13	EDID revision #	03	00000011	3	3	EDID Rev. 3
14	Video input definition	80	10000000	128		
15	Max H image size	25	00100101	37	37	37 cm(approx)
16	Max V image size	17	00010111	23	23	23 cm(approx)
17	Display Gamma	78	01111000	120	2.2	Gamma 2.2
18	Feature support	0A	00001010	10		
19	Red/green low bits	87	10000111	135		10000111
1A	Blue/white low bits	F5	11110101	245		11111110
1B	Red x/ high bits	94	10010100	148	0.580	Red x 0.580= 1001010010
1C	Red y	57	01010111	87	0.340	Red y 0.340= 0101011100
1D	Green x	4F	01001111	79	0.310	Green x 0.310= 0100111101
1E	Green y	8C	10001100	140	0.550	Green y 0.550= 1000110011
1F	Blue x	27	00100111	39	0.155	Blue x 0.155= 001001111
20	Blue y	27	00100111	39	0.155	Blue y 0.155= 001001111
21	White x	50	01010000	80	0.313	White x 0.313= 0101000001
22	White y	54	01010100	84	0.329	White y 0.329= 0101010001
23	Established timing 1	00	00000000	0		
24	Established timing 2	00	00000000	0		
25	Established timing 3	00	00000000	0		

Addr	Field	Hex	Binary	Dec	Value	Comment
26	Standard timing #1	01	00000001	1		not used
27		01	00000001	1		
28	Standard timing #2	01	00000001	1		not used
29		01	00000001	1		
2A	Standard timing #3	01	00000001	1		not used
2B		01	00000001	1		
2C	Standard timing #4	01	00000001	1		not used
2D		01	00000001	1		
2E	Standard timing #5	01	00000001	1		not used
2F		01	00000001	1		
30	Standard timing #6	01	00000001	1		not used
31		01	00000001	1		
32	Standard timing #7	01	00000001	1		not used
33		01	00000001	1		
34	Standard timing #8	01	00000001	1		not used
35		01	00000001	1		
36	Detailed timing/monitor descriptor #1	48	01001000	72	98	Main clock= 98 MHz
37		26	00100110	38		
38		A0	10100000	160	1440	Hor active=720*2 pixels
39		40	01000000	64	320	Hor blanking=320 pixels
3A		51	01010001	81		4bit : 4bit
3B		84	10000100	132	900	Vertcal active=900 lines
3C		0C	00001100	12	12	Vertical blanking=12 lines
3D		30	00110000	48		4bit : 4bit
3E		40	01000000	64	64	Hor sync. Offset=64 pixels
3F		20	00100000	32	32	H sync. Width=32 pixels
40		33	00110011	51	3 / 3	V sync. Offset=3 lines / V sync. Width=3 lines
41		00	00000000	0		2bit : 2bit :2bit :2bit
42		6F	01101111	111	367	H image size= 367 mm(approx)
43		E6	11100110	230	230	V image size = 230 mm(approx)
44		10	00010000	16		
45		00	00000000	0		No Horizontal Border
46		00	00000000	0		No Vertical Border
47		19	00011001	25		
48	Detailed timing/monitor descriptor #2	00	00000000	0		Manufacturer Specified (Timing)
49		00	00000000	0		
4A		00	00000000	0		
4B		0F	00001111	15		
4C		00	00000000	0		
4D		00	00000000	0		**Value**=HSPWmin / 2
4E		00	00000000	0		**Value**=HSPWmax / 2
4F		00	00000000	0		**Value**=Thbpmin /2
50		00	00000000	0		**Value**=Thbpmax /2
51		00	00000000	0		**Value**=VSPWmin /2
52		00	00000000	0		**Value**=VSPWmax /2
53		00	00000000	0		**Value**=Tvbpmin / 2
54		00	00000000	0		**Value**=Tvbpmax / 2
55		78	01111000	120		Thpmin=**value***2 + HA pixelclks
56		E6	11100110	230		Thpmax=**value***2 + HA pixelclks
57		02	00000010	2		Tvpmin=**value***2 + VA lines
58		23	00100011	35		Tvpmax=**value***2 + VA lines
59		00	00000000	0		Module revision

5A		00	00000000	0		ASCII Data String Tag
5B		00	00000000	0		
5C		00	00000000	0		
5D		FE	11111110	254		
5E		00	00000000	0		
5F		53	01010011	83	[S]	
60		41	01000001	65	[A]	
61	Detailed timing/monitor	4D	01001101	77	[M]	
62	descriptor #3	53	01010011	83	[S]	
63		55	01010101	85	[U]	
64		4E	01001110	78	[N]	
65		47	01000111	71	[G]	
66		0A	00001010	10	[^]	
67		20	00100000	32	[ ]	
68		20	00100000	32	[ ]	
69		20	00100000	32	[ ]	
6A		20	00100000	32	[ ]	
6B		20	00100000	32	[ ]	
6C		00	00000000	0		Monitor Name Tag (ASCII)
6D		00	00000000	0		
6E		00	00000000	0		
6F		FE	11111110	254		
70		00	00000000	0		
71		4C	01001100	76	[L]	
72		54	01010100	84	[T]	
73	Detailed timing/monitor	4E	01001110	78	[N]	
74	descriptor #4	31	00110001	49	[1]	
75		37	00110111	55	[7]	
76		30	00110000	48	[0]	
77		57	01010111	87	[W]	
78		58	01011000	88	[X]	
79		2D	00101101	45	[-]	
7A		4C	01001100	76	[L]	
7B		30	00110000	48	[0]	
7C		31	00110001	49	[1]	
7D		0A	00001010	10	[^]	
7E	Extension Flag	00	00000000	0		
7F	Checksum	A5	10100101	165		

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